



US009409853B2

(12) **United States Patent**
Schuch et al.

(10) **Patent No.:** **US 9,409,853 B2**
(45) **Date of Patent:** **Aug. 9, 2016**

(54) **POLYGLYCEROL PARTIAL ESTERS,
PREPARATION AND USE THEREOF**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 4 days.

(21) Appl. No.: **14/564,408**

(22) Filed: **Dec. 9, 2014**

(65) **Prior Publication Data**

US 2015/0315123 A1 Nov. 5, 2015

(30) **Foreign Application Priority Data**

Dec. 5, 2013 (DE) 10 2013 224 957

(51) **Int. Cl.**

C07C 59/00 (2006.01)
C07C 69/52 (2006.01)
C07C 67/08 (2006.01)
A61K 8/37 (2006.01)
C07C 69/732 (2006.01)
A61K 8/39 (2006.01)
A61Q 1/14 (2006.01)
A61Q 5/02 (2006.01)
A61Q 15/00 (2006.01)
A61K 8/86 (2006.01)
A61Q 19/10 (2006.01)

(52) **U.S. Cl.**

CPC **C07C 69/52** (2013.01); **A61K 8/375** (2013.01); **A61K 8/39** (2013.01); **A61K 8/86** (2013.01); **A61Q 1/14** (2013.01); **A61Q 5/02** (2013.01); **A61Q 15/00** (2013.01); **A61Q 19/10** (2013.01); **C07C 67/08** (2013.01); **C07C**

69/732 (2013.01); **A61K 2800/30** (2013.01); **A61K 2800/49** (2013.01)

(58) **Field of Classification Search**

CPC **C07C 69/52**; **C07C 67/08**; **C07C 69/732**; **A61K 8/375**; **A61K 8/39**; **A61K 8/86**; **A61Q 1/14**; **A01O 5/02**; **A01O 15/00**; **A01O 19/10**
USPC **554/219**
See application file for complete search history.

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(57) **ABSTRACT**

Polyglycerol partial esters of a specific composition which are capable of solubilizing very hydrophobic, oil-soluble substances in aqueous solution are provided. The preparation and use of these polyglycol ether-free solubilizers in cosmetic formulations are also disclosed.

18 Claims, No Drawings

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POLYGLYCEROL PARTIAL ESTERS, PREPARATION AND USE THEREOF

FIELD OF THE INVENTION

The present invention relates to polyglycerol partial esters of a specific composition which are capable of solubilizing very hydrophobic, oil-soluble substances in aqueous solution. The present invention also relates to the preparation and use of these polyglycol ether-free solubilizers in cosmetic formulations.

PRIOR ART

Non-ionic surfactants having hardly any foam-generating effect are usually employed as solubilizers of oil-soluble, hydrophobic substances in water.

Polyethoxylated triglycerides, particularly based on castor oil, e.g., PEG-40 hydrogenated castor oil, are used as standard solubilizers. The latter is virtually able to clearly solubilize oil-soluble substances of a wide variety of structures and hydrophobicity in water. Polyglycol ether-free polyglycerol partial esters have also been used for some years as alternative solubilizers.

The disadvantage of all polyglycerol partial esters available to date is that their use as solubilizers of oil-soluble substances in water cannot cover as wide a substance spectrum as the previously mentioned polyethoxylated triglycerides. The polyglycerol esters are thus mainly suitable for solubilizing "small" molecules such as, for example, short-chain terpenes. In contrast, oils based on fatty acids and triglycerides of long-chain fatty acids such as jojoba oil, almond oil, soybean oil or avocado oil cannot, to date, be clearly solubilized in water using the commercial products based on polyglycerol partial esters.

JP 2008-119568 describes the use of polyglycerol partial esters as solubilizers of oils in which the polyglycerol partial esters are based on mixtures of saturated fatty acids having 8 to 22 carbon atoms and unsaturated fatty acids having 16 to 22 carbon atoms, wherein the molar ratio of saturated to unsaturated fatty acids is in a range of 0.2 to 0.8 to 0.8 to 0.2. In addition, polyglycerol partial esters of polyricinoleic acid may be admixed with this polyglycerol partial ester.

SUMMARY OF THE INVENTION

One object of the present invention is to provide solubilizers based on polyglycerol partial esters which, in contrast to the products available on the market to date, are able to clearly solubilize, in particular, hydrophobic, oil-soluble substances, such as long-chain triglycerides, in water and to solubilize cosmetic formulations.

It has been surprisingly found that the polyglycerol partial esters described in the present invention are able to rectify the disadvantages of the prior art and thus enable to achieve the object of the present invention mentioned above.

In one embodiment of the present invention, polyglycerol partial esters are provided which are prepared from polyglycerol by esterification of a specifically selected fatty acid mixture. The products are able to clearly solubilize very hydrophobic, oil-soluble substances, such as long-chain triglycerides, in water or to solubilize a cosmetic formulation. The preparation and use of these solubilizers in cosmetic formulations is also part of this invention.

An advantage of the present invention is that the polyglycerol partial esters described herein are able to clearly solubilize strongly hydrophobic, oil-soluble substances, such as

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long-chain triglycerides, in water or to solubilize a cosmetic formulation, which is not possible using the products based on polyglycerol esters available to date.

A further advantage of the present invention is that the polyglycerol partial esters described herein may be prepared exclusively from renewable raw materials in contrast to polyethoxylated triglycerides.

A yet further advantage of the present invention is that the polyglycerol partial esters described herein are liquid, and thus readily processable, in contrast to polyethoxylated triglycerides.

An even further advantage of the present invention compared to the polyethoxylated triglycerides is that the polyglyceryl esters described herein lead to particularly clear dispersions of the oil in the water, and also no cloudiness occurs on storage, in contrast to polyethoxylated triglycerides (PEG-40 hydrogenated castor oil).

Another advantage of the present invention is that formulations may be provided that are polyglycol ether-free.

A further advantage of the polyglycerol partial esters described herein is that the polyglycerol partial esters of the present invention can produce a pleasant skin sensation in cosmetic formulations.

Another advantage of the polyglycerol partial esters described herein is that the polyglycerol partial esters of the present invention exhibit only a very low foam formation on stirring in water.

A further advantage is that the polyglycerol partial esters described herein show only a very low effect on foamability and foam quantity in surfactant formulations, but the foam creaminess can, however, improve.

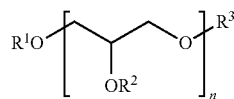
Another advantage is that the polyglycerol partial esters described in the present invention may lead to attenuation of the skin irritancy in surfactant formulations.

A further advantage of the polyglycerol partial esters described herein is that the polyglycerol partial esters of the present invention can have a stabilizing effect in emulsions.

A further advantage of the inventive products is that they are relatively stable to oxidation and more stable with respect to color, odor and appearance.

DETAILED DESCRIPTION OF THE INVENTION

The present invention provides polyglycerol partial esters of general formula I



general formula I

where
n=2 to 16, preferably 4 to 14, particularly preferably 5 to 11,
R¹, R², R³=independently of one another, identical or different, selected from H, R⁴ and R⁵, where

R⁴=saturated or unsaturated acyl residue having 6-22 carbon atoms, preferably 8-18 carbon atoms, comprising no hydroxyl groups,

R⁵=saturated or unsaturated acyl residue having 6-22 carbon atoms, preferably 14-22 carbon atoms, comprising at least one hydroxyl group or an acyl residue of an oligomer of saturated or unsaturated acyl residues having 6-22 carbon atoms, preferably 14-22 carbon atoms, comprising at least

one hydroxyl group, in which the acyl residue of the oligomer preferably has 26 to 66 carbon atoms, characterized in that the molar ratio of the acyl residues R^4 to R^5 is in a range of 95:5 to 5:95, preferably 85:15 to 15:85, particularly preferably 85:15 to 50:50.

A person skilled in the art is aware that the polyglycerol base skeleton present in general formula I, owing to its polymeric property, represents a random mixture of various compounds. Polyglycerol may have formed ether bonds between two primary, one primary and one secondary and also two secondary positions of the glycerol monomers. For this reason, the polyglycerol base skeleton does not usually consist exclusively of linearly linked glycerol units, but may also comprise branches and rings. For details see, e.g., "Original synthesis of linear, branched and cyclic oligoglycerol standards", Cassel et al., *J Org. Chem.* 2001, 875-896.

Structures of this kind are covered in this respect in the simplified, general formula I.

From the term "the molar ratio of the acyl residues R^4 to R^5 is in a range of 95:5 to 5:95", it is clear that residues R^4 and R^5 are present in the polyglycerol partial esters according to the invention.

Preferred polyglycerol partial esters according to the invention are characterized in that they comprise structures of general formula 1) each having at the same time at least one R^4 residue and one R^5 residue.

The acyl residues R^4 and R^5 can be randomly attached to the polyglycerol base skeleton both via primary and via secondary hydroxyl groups.

All conditions such as, for example, pressure and temperature, if not stated otherwise, are standard conditions (20° C., 1 bar). Percentages are indicated, if not described otherwise, in mass percent.

The degree of polymerisation 'n' can thus be determined, whereby the hydroxyl number of the polyglycerol used for the synthesis of the inventive ester is determined, in which the mean degree of polymerisation n is related to the hydroxyl number of the polyglycerol on which it is based via the following equation:

$$n = \frac{\frac{2000 \cdot M(\text{KOH})}{\text{OHZ}} - M(\text{Water})}{\left[\frac{M(\text{Glycerol}) - M(\text{Water})}{\text{OHZ}} - \frac{1000 \cdot M(\text{KOH})}{\text{OHZ}} \right]}$$

where M=molar mass; OHZ=hydroxyl number of the free polyglycerol.

Alternatively, the degree of polymerisation 'n' can also be determined by determining the hydroxyl number of the polyglycerol obtained after complete ester hydrolysis.

Suitable methods for determining the hydroxyl number are particularly those according to DGF C-V 17 a (53), Ph. Eur. 2.5.3 Method A and DIN 53240.

The acyl residues R^4 and R^5 are preferably acyl residues of fatty acids. R^4 and R^5 may also represent mixtures of such acyl residues, particularly technical mixtures such as, in the case of R^4 , coconut fatty acid cuts.

For R^4 , it is with particular preference that at least 50 mol %, preferably at least 75 mol %, of the R^4 acyl residues are selected from capryloyl, caproyl and lauroyl residues, based on all R^4 residues in the polyglycerol partial ester.

R^5 is particularly preferably selected from ricinoyl and hydroxystearoyl residues, their oligomers and mixtures thereof, particularly preferably at least 90 mol % of the R^5 acyl residues comprise ricinoyl residues or a mixture of rici-

noyl and hydroxystearoyl residues, based on all R^5 residues in the polyglycerol partial ester, in which it is preferred that the mixture of ricinoyl and hydroxystearoyl residues has a molar ratio of ricinoyl to hydroxystearoyl residues in a range of 100 to 0.1 to 50 to 50.

As an alternative, R^5 is preferably selected from ricinoyl residues.

Preferred polyglycerol partial esters according to the invention are characterized in that the weight ratio of the polyglyceryl residue to the sum total of the acyl residues R^4 and R^5 is 85:15 to 55:45, preferably 80:20 to 60:40, particularly preferably 75:25 to 65:35.

Preferred polyglycerol partial esters according to the invention are further characterized in that the molar ratio of saturated to unsaturated acyl residues in the sum total of all R^4 and R^5 residues is 99:1-1:99, preferably 95:5-50:50, particularly preferably 90:10-60:40.

The polyglycerol partial esters of the present invention can be prepared by classical esterification and transesterification methods, preferably by the inventive method described hereinafter.

The present invention further relates to a method for preparing polyglycerol partial esters comprising the method steps of:

A) providing a polyglycerol having a mean degree of polymerisation $n=2$ to 16, preferably 4-14, particularly preferably 5-11,

B) acylation of some of the hydroxyl groups of the polyglycerol with

at least one first carboxylic acid derivative of one or more first, saturated or unsaturated carboxylic acids having 6-22 carbon atoms, preferably 8-18 carbon atoms, comprising no hydroxyl groups and

at least one second carboxylic acid derivative of one or more second, saturated or unsaturated carboxylic acids having 6-22 carbon atoms, preferably 14-22 carbon atoms, comprising at least one hydroxyl group or an oligomer of the second carboxylic acid, wherein the oligomer preferably has 26 to 66 carbon atoms,

in which the carboxylic acid derivatives are selected from carboxylic acids and carboxylic esters, wherein triglycerides are preferred as carboxylic esters in accordance with the invention,

wherein the molar ratio of the acyl residues of the first carboxylic acid derivative used in method step B) to those of the second carboxylic acid derivative is in a range of 95:5 to 5:95, preferably 85:5 to 15:85, particularly preferably 85:15 to 50:50.

The carboxylic acid derivatives preferably used in the method according to the invention are fatty acid derivatives.

In the method according to the invention, therefore, in method step B)

at least one first carboxylic acid and at least one second carboxylic acid,

at least one first carboxylic ester and at least one second carboxylic acid,

at least one first carboxylic acid and at least one second carboxylic ester,

at least one first carboxylic ester and at least one second carboxylic ester,

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at least one first carboxylic ester and at least one second carboxylic acid and at least one second carboxylic ester, or at least one first carboxylic acid and at least one first carboxylic ester and at least one second carboxylic acid and at least one second carboxylic ester, may be used.

A preferred method according to the invention is characterized in that at least 50 mol %, preferably at least 75 mol %, of the first carboxylic acids are selected from caprylic acid, capric acid and lauric acid, based on the acyl residues of all the first carboxylic acid derivatives.

It is preferred in accordance with the invention, in the method according to the invention, that at least 90 mol % of the second carboxylic acids are selected from ricinoleic acid and hydroxystearic acid, based on the acyl residues of all the second carboxylic acid derivatives.

A preferred method according to the invention is characterized in that at least 90 mol % of the second carboxylic acids comprise ricinoleic acid and/or hydroxystearic acid, wherein the second carboxylic acids preferably have a molar ratio of ricinoleic acid residues to hydroxystearic acid residues in a range of 100 to 0.1 to 50 to 50, based on the acyl residues of all the second carboxylic acid derivatives.

Alternatively, the second carboxylic acid derivative is preferably selected from ricinoleic acid or castor oil.

It is preferred, in the method according to the invention, that the weight ratio of the polyglycerol to the calculated sum total of the acyl residues of the first and second carboxylic acid derivatives used is 85:15 to 55:45, preferably 80:20 to 60:40, particularly preferably 75:25 to 65:35.

A preferred method according to the invention is characterized in that the molar ratio of the acyl residues of saturated to those of the unsaturated carboxylic acid derivatives used in method step B) is 99:1-1:99, preferably 95:5-50:50, particularly preferably 90:10-60:40.

The present invention furthermore relates to polyglycerol partial esters, obtainable by the method according to the invention, wherein the preferred partial esters according to the invention are those which are obtainable by the preferred method according to the invention.

The present invention further relates to formulations, particularly cosmetic and pharmaceutical formulations, wherein particular preference is given to cosmetic formulations which comprise at least one polyglycerol partial ester according to the invention and/or at least one polyglycerol partial ester obtainable by the method according to the invention.

Particular preference is given to formulations which are essentially polyglycol ether-free and essentially free of alkoxylated compounds. The term "essentially free of alkoxylated compounds" and "essentially polyglycol ether-free", in connection with the present invention, are understood to mean that the formulations have no notable amounts of alkoxylated compounds or compounds comprising polyglycol ethers which exert a surface-active effect. This is particularly understood to mean that these compounds are present in amounts of less than 1% by weight, preferably less than 0.1% by weight, particularly preferably less than 0.01% by weight, based on the total formulation, in particular no detectable amounts.

The polyglycerol partial esters of the present invention can be used advantageously for preparing care and cleaning formulations, particularly for skin and skin appendages, such as liquid soaps, shower gels, oil baths, make-up removers or shampoos, shower gels, foam baths, liquid soaps, hair shampoos, 2-in-1 shampoos, hair conditioners, permanent wave fixing solutions, hair colouring shampoos, hair setting com-

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positions, hair treatments, hair arranging compositions, hair styling compositions, blow-drying lotions, setting foams, hair treatments, leave-in conditioners, hair smoothing compositions, shine improving compositions and compositions for colouring the hair. The present invention therefore also relates to such uses.

The present invention thus also provides care and cleaning formulations, in particular for skin and skin appendages, comprising polyglycerol partial esters according to the invention.

The term "care formulation" is herein understood to mean a formulation which satisfies the purpose of restoring an object to its original form, of reducing or avoiding the effects of external influences (e.g., time, light, temperature, pressure, soiling, chemical reaction with other reactive compounds that come into contact with the object) such as ageing, soiling, material fatigue, bleaching or even of improving desired positive properties of the object. For the last point, mention may be made for example of a shine of the object under consideration.

Cosmetic care and cleaning formulations according to the invention can, for example, comprise at least one additional component selected from the group of:

- emollients,
- emulsifiers,
- thickeners/viscosity regulators/stabilizers,
- antioxidants,
- hydrotropes (or polyols),
- solids and fillers,
- pearlescence additives,
- deodorant and antiperspirant active ingredients,
- insect repellents,
- self-tanning agents,
- preservatives,
- conditioners,
- perfumes,
- cosmetic active ingredients,
- care additives,
- superfatting agents,
- solvents.

Substances which can be used as exemplary representatives of the individual groups are known to a person skilled in the art and can be found, for example, in EP2273966A1. This patent application is herewith incorporated as reference and thus forms part of the disclosure.

As regards to further optional components and the amounts of these components used, reference is made expressly to the relevant handbooks known to a person skilled in the art, e.g., K. Schrader, "Grundlagen und Rezepturen der Kosmetika [Fundamentals and Formulations of Cosmetics]", 2nd edition, pages 329 to 341, Hüthig Buch Verlag Heidelberg.

The amounts of the particular additives are governed by the intended use. Typical guide formulations for the respective applications are known prior art and are contained for example in the brochures of the manufacturers of the particular basic materials and active ingredients. These existing formulations can usually be adopted unchanged. If necessary, the desired modifications can, however, be undertaken without complication by means of simple experiments for the purposes of adaptation and optimization.

Preferred formulation according to the invention comprise preferred polyglycerol partial esters according to the invention as set out above or preferred polyglycerol partial esters according to the invention obtainable by the method according to the invention as set out above.

It is preferred if the formulation according to the invention additionally comprise at least one oil-soluble substance and water.

In the present invention, oil-soluble substances are understood to mean substances having a log P (logarithm of n-octanol/water partition coefficient, also known as log K_{OW}) of at least 2.

Preference is given to oil-soluble substances having a log P of at least 5. Particular preference is given to oil-soluble substances selected from the group comprising oils based on fatty acids, triglycerides of long-chain fatty acids, cosmetic ester oils, pure hydrocarbons such as jojoba oil, almond oil, soybean oil, avocado oil, olive oil, argan oil, rapeseed oil, sunflower oil, neem oil, caprylic/capric acid triglyceride, shea butter, decyl cocoate, isopropyl palmitate, myristyl myristate and isohexadecane.

Particularly preferred formulations according to the invention comprise 0.1% by weight to 40% by weight, preferably 0.3% by weight to 35% by weight, particularly preferably 0.5% by weight to 10% by weight, of polyglycerol partial ester according to the invention and/or polyglycerol partial ester obtainable by the method according to the invention, 0.01% by weight to 40% by weight, preferably 0.1% by weight to 30% by weight, particularly preferably 0.2% by weight to 2% by weight, of oil-soluble substance and 10% by weight to 98% by weight, preferably 20% by weight to 95% by weight, particularly preferably 45% by weight to 90% by weight, of water.

The present invention also relates to the use of at least one polyglycerol partial ester according to the invention and/or at least one polyglycerol partial ester obtainable by the method according to the invention for solubilizing at least one oil-soluble substance in water, wherein it is preferable in accordance with the invention that preferred polyglycerol partial esters according to the invention as set out above or preferred polyglycerol partial esters according to the invention obtainable by the method according to the invention as set out above are used.

The examples listed below describe the present invention by way of example, without any intention of restricting the invention, the scope of application of which is apparent from the entirety of the description and the claims, to the embodiments specified in the examples.

EXAMPLES

Example 1

Preparing Inventive Polyglycerol Partial Esters

1.1 Preparation of Polyglycerol Partial Ester A:

Under a nitrogen atmosphere, 225 g of polyglycerol (hydroxyl number=935 mg KOH/g) were stirred with 39.4 g of caprylic/capric acid and 20.8 g of refined coconut fatty acid and 22.1 g of ricinoleic acid and 15.5 g of hydroxystearic acid at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course of the reaction was continuously distilled off. After cooling to room temperature, the reaction product was in the form of a turbid liquid.

1.2 Preparation of Polyglycerol Partial Ester B:

Under a nitrogen atmosphere, 225 g of polyglycerol (hydroxyl number=996 mg KOH/g) were stirred with 39.4 g of caprylic/capric acid and 20.8 g of refined coconut fatty acid and 22.1 g of ricinoleic acid and 15.5 g of hydroxystearic acid at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course of the reaction was con-

tinuously distilled off. After cooling to room temperature, the reaction product was in the form of a turbid liquid.

1.3. Preparation of Polyglycerol Partial Ester C:

Under a nitrogen atmosphere, 225 g of polyglycerol (hydroxyl number=935 mg KOH/g) were stirred with 47.3 g of caprylic/capric acid and 20.8 g of refined coconut fatty acid and 17.7 g of ricinoleic acid and 12.4 g of hydroxystearic acid at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course of the reaction was continuously distilled off. After cooling to room temperature, the reaction product was in the form of a turbid liquid.

1.4. Preparation of Polyglycerol Partial Ester D:

Under a nitrogen atmosphere, 202 g of polyglycerol (hydroxyl number=884 mg KOH/g) were stirred with 37.7 g of caprylic/capric acid and 24.9 g of refined coconut fatty acid and 23.5 g of ricinoleic acid and 12.4 g of hydroxystearic acid at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course of the reaction was continuously distilled off. After cooling to room temperature, the reaction product was in the form of a turbid liquid.

1.5. Preparation of Polyglycerol Partial Ester E:

Under a nitrogen atmosphere, 225 g of polyglycerol (hydroxyl number=935 mg KOH/g) were stirred with 39.4 g of caprylic/capric acid and 23.0 g of refined coconut oil and 41.5 g of castor oil at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course of the reaction was continuously distilled off. After cooling to room temperature, the reaction product was in the form of a turbid liquid.

1.6. Preparation of Polyglycerol Partial Ester F:

Under a nitrogen atmosphere, 225 g of polyglycerol (hydroxyl number=935 mg KOH/g) were stirred with 39.4 g of caprylic/capric acid and 23.0 g of refined coconut oil and 23.0 g of castor oil and 14.2 g of castor wax at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course of the reaction was continuously distilled off. After cooling to room temperature, the reaction product was in the form of a turbid liquid.

1.7. Preparation of Polyglycerol Partial Ester G:

In a first reaction, 225 g of polyglycerol (hydroxyl number=935 mg KOH/g) were stirred under a nitrogen atmosphere with 38.0 g of caprylic acid and 60 g of castor oil at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course of the reaction was continuously distilled off.

In a second reaction, 225 g of polyglycerol (hydroxyl number=1060 mg KOH/g) were reacted under identical reaction conditions with 41.0 g of capric acid, 23 g of castor oil and 46.0 g of refined coconut oil.

The two products were then combined and stirred at 90° C. until a clear, homogeneous mixture was formed, which, after cooling to room temperature, was in the form of a turbid liquid.

Example 2

Preparing Non-Inventive Polyglycerol Partial Esters

2.1. Preparation of Polyglycerol Partial Ester H:

Under a nitrogen atmosphere, 394 g of polyglycerol (hydroxyl number=1061 mg KOH/g) were stirred with 51.3 g of caprylic/capric acid and 23.0 g of refined coconut fatty acid and 32.8 g of oleic acid at 240° C. until an acid number<0.5 mg KOH/g was achieved. The water formed during the course

of the reaction was continuously distilled off. After cooling to room temperature, the reaction product was in the form of a turbid liquid.

Example 3

Non-Inventive, Commercial Comparative Examples

3.1. TEGOSOFT® PC 41:

Standard solubilizer, polyether-free. INCI: Polyglyceryl-4 caprate. Commercial product of Evonik Industries AG.

3.2. NATRAGEM® S 150 NP-LQ-(CM):

Solubilizer for oils, polyether-free. INCI: Polyglyceryl-4 laurate/sebacate (and) polyglyceryl-4 caprylate/caprate (and) water. Commercial product of Croda.

3.3. TAGAT® CH 40:

Standard solubilizer, polyether-containing. INCI: PEG-40 Hydrogenated castor oil. Commercial product of Evonik Industries AG.

The products described above were tested in cosmetic formulations below.

The formulation constituents are named in the compositions in the form of the generally recognized INCI nomenclature using the English terms. All concentrations are given in the application examples in percent by weight.

Example 4

Improved Dissolving Power of the Inventive Polyglycerol Partial Esters in Aqueous Solutions in Comparison to the Non-Inventive Polyglycerol Partial Esters

In order to investigate the dissolving power of the inventive polyglycerol partial esters, these were mixed with cosmetic oils and treated with water. The oils tested were avocado oil (supplier: Gustav Heess) and caprylic/capric triglycerides (TEGOSOFT® CT, Evonik Industries AG). The proportion of solubilizer required to completely dissolve 0.5% of the respective oil in water was investigated. For this purpose, the solubilizer (various amounts) was thoroughly mixed with the oil (0.5 g) and then slowly treated with water (made up to 100 g) with stirring. The mixture was stirred for one hour at 45° C. After cooling to 20° C., a "clear mixture" must not become turbid again over a period of 1 week.

In Table 1, the resulting mass ratios of solubilizer to oil which were required to obtain clear mixtures are summarized.

TABLE 1

Solubilizer-to-oil ratio required for a clear solution of the oil in water.		
	Avocado oil	Caprylic/capric triglycerides
Polyglycerol partial ester A	10:1	4:1
Polyglycerol partial ester E	8:1	4:1
Polyglycerol partial ester F	9:1	4:1
Polyglycerol partial ester G	11:1	5:1
Polyglycerol partial ester H (non-inventive)	>20:1	9:1
TEGOSOFT® PC 41 (non-inventive)	>20:1	16:1
TAGAT® CH 40 (non-inventive)	6:1	6:1

It is evident from the results in Table 1 that the inventive polyglycerol partial esters A, E, F and G have distinctly better solubilizing properties than the polyether-free comparative examples polyglycerol partial ester H and TEGOSOFT® PC

41. Surprisingly, similar solubilizer-to-oil ratios are even achieved as with the polyether-containing standard solubilizer TAGAT® CH 40 and whose performance is to some extent even exceeded.

Example 5

Improved Dissolving Power of the Inventive Polyglycerol Partial Esters in Surfactant Formulations in Comparison to the Non-Inventive Polyglycerol Partial Esters

In addition to the dissolving properties of the inventive polyglycerol partial esters for oil in water shown in example 4, the dissolving power for oils in surfactant formulations was also investigated.

For this purpose, the respective solubilizer was mixed with 0.5 g of caprylic/capric triglycerides (TEGOSOFT® CT, Evonik Industries AG) at 60° C. for 5 min. The water was then slowly added at 60° C. with stirring and the mixture was stirred for 10 min. The mixture was then cooled to 30° C. over a period of 30 min. The mixture was then treated with the surfactants with stirring.

The proportion of solubilizer required to completely dissolve 0.5% of the oil in the respective surfactant system was investigated. Two surfactant systems were used: a standard lauryl ether sulphate/betaine mixture (Table 2) and a polyether-free formulation (Table 3). In Table 4, the resulting mass ratios of solubilizer-to-oil which were required to obtain clear mixtures are summarized.

TABLE 2

Formulation Y for assessment of the solubilizing properties in a standard surfactant system.	
Solubilizer	X %
TEGOSOFT® CT, Evonik Industries AG, (INCI: Caprylic/capric triglycerides)	0.5%
Water	to 100.0%
Texapon® NSO, BASF Cognis, 28%, (INCI: Sodium laureth sulphate)	32.0%
TEGO® Betaine F 50, Evonik Industries AG, 38%, (INCI: Cocamidopropyl betaine)	8.0%
Polymer JR 400, Amerchol, (Polyquaternium-10)	0.2%
Citric acid, 30%	to pH 5.5

TABLE 3

Formulation Z for assessment of the solubilizing properties in a polyether-free surfactant system.	
Solubilizer	X %
TEGOSOFT® CT, Evonik Industries AG, (INCI: Caprylic/capric triglycerides)	0.5%
Water	to 100.0%
REWOTERIC® AM C, Evonik Industries AG, 32%, (INCI: Sodium cocoamphoacetate)	17.5%
Plantacare 1200 UP, BASF Cognis, 50%, (INCI: Lauryl glucoside)	8.8%
Plantacare 818 UP, BASF Cognis, 51%, (INCI: Coco glucoside)	2.4%
PERLASTAN® SC 25 NKW, Schill&Seilacher, 25%, (Disodium/sodium cocoyl glutamate)	14.4%
Citric acid, 30%	to pH 5.2

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TABLE 4

Solubilizer-to-oil ratio required for a clear solution of TEGOSOFT ® CT in the surfactant formulations.		
	TEGOSOFT ® CT in formulation Y	TEGOSOFT ® CT in formulation Z
Polyglycerol partial ester A	6:1	8:1
Polyglycerol partial ester F	5:1	6:1
NATRAGEM ® S 150	12:1	11:1
NP-LQ-(CM) (non-inventive)		
TEGOSOFT ® PC 41 (non-inventive)	12:1	14:1
TAGAT ® CH 40 (non-inventive)	8:1	5:1

The results in Table 4 show that the inventive polyglycerol partial esters A and F have distinctly improved solubilizer properties in comparison to the comparative products NATRAGEM® S 150 NP-LQ-(CM) and TEGOSOFT® PC 41. Surprisingly, better results were also obtained to some extent with the inventive polyglycerol partial esters A and F than with the polyether-containing product TAGAT® CH 40.

Example 6

Improved Skin Care Power and Foam Properties of the Inventive Polyglycerol Partial Esters in Surfactant Mixtures in Comparison to Non-Inventive Polyglycerol Partial Esters

To evaluate the skin care benefit and the foam properties of the inventive polyglycerol partial ester G in aqueous surfactant formulations, a sensory handwashing test was conducted in comparison to the comparative example TEGOSOFT® PC 41 according to the prior art.

A group consisting of 10 trained test personnel washed their hands in a defined manner and assessed foam properties and skin feel using a grading scale from 1 (poor) to 5 (very good).

The products were tested in each case in a standardized surfactant formulation, using the standard surfactant system of 9% active sodium laureth sulphate and 3% active cocamidopropyl betaine (Table 5).

TABLE 5

Test formulations for the handwashing test:			
Formulation examples	U	V	W
Texapon ® NSO-IS, BASF Cognis, 28%, (INCI: Sodium laureth sulphate)	32.0%	32.0%	32.0%
TEGO ® Betaine F 50, Evonik Industries AG, 38%, (INCI: Cocamidopropyl betaine)	8.0%	8.0%	8.0%
NaCl	1.5%	1.5%	1.5%
Citric acid	0.2%	0.2%	0.2%
Water, demineralized	58.3%	55.3%	55.3%
Polyglycerol partial ester G (inventive)	—	3.0%	—
TEGOSOFT ® PC 41 (non-inventive)	—	—	3.0%

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The sensory test results are summarized in Table 6.

TABLE 6

Results of the handwashing test:			
Test formulation	U	V	W
Foaming behaviour	3.3	3.6	3.5
Foam volume	3.1	3.3	3.2
Foam creaminess	2.9	4.1	3.7
Skin feel during washing	2.9	3.1	3.0
Rinseability	3.3	3.8	3.7
Skin smoothness	2.1	2.8	2.4
Skin softness	2.3	3.1	2.8
Skin smoothness after 3 min	3.1	3.8	3.6
Skin softness after 3 min	2.9	3.7	3.4

It is evident from the test results in Table 6 that the inventive formulation V using the inventive polyglycerol partial ester G is superior, surprisingly, in all application properties in comparison to the comparative formulation W according to the prior art. In this light, the results of the inventive formulation V can be designated as very good and show a distinct improvement compared to the prior art.

It is evident from the measurements that the inventive polyglycerol partial ester G in formulation V led especially to a significant improvement specifically of the foam creaminess and also the skin smoothness and the skin softness.

Further Formulation Examples

The formulation examples given in the tables below show exemplary representatives of a large number of possible compositions according to the invention.

If the preparation of the formulation requires the separate preparation or mixing of formulation constituents beforehand, this is termed multiphase preparation. If a two-phase preparation is required, the two phases are labelled A and B in the stated tables. In the case of three- or more-phase processes, the phases are called A, B, C etc. Unless stated otherwise, the data in the tables are data in % by weight. In the following formulation examples, the data or % by weight are based on the respective active substance. Some products, however, are commercially available as solutions, especially in water, such that in these cases more of the commercial products were used accordingly, depending on the active content.

“Product example A to G” corresponds to the “polyglycerol partial esters A to G of example 1”.

TABLE 7

Formulation for Wet Wipes	
Butylene glycol	2.0%
Glycerol	1.0%
Product example A	1.0%
Silicone quaternium-22; Polyglycerol-3 caprate;	0.5%
Dipropylene glycol; Cocamidopropyl betaine	
Allantoin	0.2%
Maltodextrin	0.5%
Chamomilla extract	0.1%
Phenoxyethanol; Ethylhexyl glycerol	0.7%
Perfume	q.s.
Water	to 100.0%
Citric acid, 30%	to pH 5.5

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TABLE 8

Bath cream		
Water	to 100.0%	
Sodium laureth sulphate	8.0%	5
Coco glucoside	4.0%	
Cocamidopropyl betaine	5.0%	
Product example B	1.0%	
PEG-18 Glyceryl oleate/cocoate	2.0%	
PEG-40 Sorbitan peroleate	1.4%	
Perfume (fragrance)	0.2%	10
<i>Argania spinosa</i> kernel oil	0.2%	
<i>Citrus aurantifolia</i> (lime) oil	0.2%	
Linalool	0.1%	
Coumarin	0.1%	
Glycerol	0.5%	
Glycol distearate	0.5%	15
Styrene/acrylates copolymer	0.2%	
Tocopherol	0.1%	
Preservative	q.s.	
Citric Acid	to pH 5.2	

TABLE 9

Shower cream		
Water	to 100.0%	
Glycerol	4.0%	25
Sodium laureth sulphate	4.0%	
Cocamidopropyl betaine	3.5%	
Product example G	2.0%	
Coco glucoside	2.0%	
<i>Ricinus communis</i> seed oil seed)	0.5%	30
Glyceryl oleate	0.5%	
<i>Argania spinosa</i> kernel oil	0.1%	
<i>Butyrospermum parkii</i> butter extract	0.1%	
Limonene	0.1%	
Perfume (fragrance)	0.2%	
Acrylates/C10-30 alkyl acrylate crosspolymer	0.2%	35
Hydroxypropyl methylcellulose	0.2%	
Styrene/acrylates copolymer	0.2%	
Sodium hydroxide	0.2%	
Glycol distearate	0.4%	
Silica	0.2%	
Tocopherol	0.1%	
Preservative	q.s.	40
Citric acid	to pH 5.2	

TABLE 10

Shower oil		
<i>Helianthus annuus</i> seed oil	10.0%	
<i>Ricinus communis</i> seed oil	10.0%	
MIPA-Laureth sulphate	20.0%	
Product example A	15.0%	
Laureth-4	0.5%	50
Cocamide DEA	0.9%	
Perfume (fragrance)	0.2%	
<i>Prunus amygdalus dulcis</i> oil	0.8%	
<i>Argania spinosa</i> kernel oil	0.8%	
Water	0.5%	55
Preservative	q.s.	
Citric acid	to pH 5.5	

TABLE 11

Bath oil		
Water	to 100.0%	
Sodium laureth sulphate	7.0%	
Cocamidopropyl betaine	6.0%	
Cocamide DEA	2.5%	65
Sodium trideceth sulphate	2.2%	

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TABLE 11-continued

Bath oil		
Product example E	2.0%	
Perfume (fragrance)	0.5%	
PEG-40 Hydrogenated castor oil	0.1%	
Trideceth-9	0.2%	
Sodium lauroamphoacetate	0.5%	
Benzophenone-4	0.2%	
Cocamide MEA	0.4%	
Propylene glycol	0.5%	
Disodium EDTA	0.1%	
Sodium chloride	0.5%	
Glycerol	0.4%	
Benzyl alcohol	0.4%	
<i>Argania spinosa</i> oil	0.2%	
Sodium cocoyl glutamate	0.3%	
Phenoxyethanol	0.2%	
Xanthan gum	0.2%	
Carbomer	0.2%	
Lactic acid	0.3%	
Magnesium chloride	0.1%	
Coumarin	0.1%	
Citric acid	to pH 5.2	
Preservative	q.s.	

TABLE 12

Shower cream		
Water	to 100.0%	
Sodium laureth sulphate	10.0%	
Glycerol	3.0%	
Cocamidopropyl betaine	3.0%	
Product example F	2.0%	
Decyl glucoside	1.5%	
Perfume	q.s.	35
<i>Glycine</i> soya oil	0.2%	
<i>Helianthus annuus</i> seed oil	0.1%	
Lecithin	0.2%	
Coco glucoside	0.5%	
Glyceryl oleate	0.3%	
Coumarin	0.1%	40
Preservative	q.s.	

TABLE 13

Body shampoo		
Phase A	Product example F	3.0%
	<i>Simmondsia chinensis</i> (jojoba) seed oil	0.7%
	Perfume	0.2%
50 Phase B	Sodium cocoamphoacetate	4.0%
Phase C	Water	to 100.0%
	Acrylates/C10-30 alkyl acrylate crosspolymer	0.9%
Phase D	Sodium lauroyl methyl isethionate	4.0%
	Capryl/capramidopropyl betaine	2.0%
	Citric acid	1.3%
55 Phase E	Water	10.0%
	Polyquaternium-7	0.3%
	Preservative	q.s.

TABLE 14

Body shampoo		
Phase A	Product example C	6.5%
	<i>Simmondsia chinensis</i> (jojoba) seed oil	0.4%
	Perfume	0.2%
65 Phase B	Water	to 100.0%
Phase C	Sodium cocoamphoacetate	4.0%

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TABLE 14-continued

Body shampoo		
Phase D	Water	30.0%
	Acrylates/beheneth-25 methacrylate copolymer	2.0%
	Sodium lauroyl methyl isethionate	4.0%
	Disodium lauryl sulphosuccinate	2.0%
Phase E	Preservative	q.s.

TABLE 15

Shampoo		
Phase A	Product example E	3.0%
	Caprylic/capric triglyceride	0.5%
	Perfume	0.2%
Phase B	Water	to 100.0%
Phase C	Sodium cocoamphoacetate	7.0%
Phase:	Glycerol	1.0%
	Xanthan gum	0.8%
	Water	25.0%
Phase E	Water	10.0%
	Acrylates/beheneth-25 methacrylate copolymer	2.0%
Phase F	Water	10.0%
	Polyquaternium-10)	0.2%
Phase G	Cocamidopropyl betaine	5.0%
	Preservative	q.s.

TABLE 16

Shampoo		
Phase A	Product example E	8.0%
	<i>Argania spinosa</i> kernel Oil	0.5%
Phase:	Water	to 100.0%
Phase C	Perfume	0.3%
	Polyglyceryl-6 caprylate; Polyglyceryl-4 caprate;	2.0%
	Propylene glycol	
Phase D	Water	20.0%
Phase E	Sodium laureth sulphate	9.0%
Phase F	Water	10.0%
	Cocamidopropyl betaine	3.0%
	PEG-120 methyl glucose dioleate	1.0%
Phase G	Water	10.0%
	Sodium chloride	0.7%
	Polyquaternium-10	0.2%
Phase H	Citric acid	to pH 5.5
Phase I	Preservative	q.s.

TABLE 17

Shower gel		
Phase:	Product example F	3.0%
	Caprylic/capric triglyceride	0.5%
	Perfume	0.2%
Phase B	Water	to 100.0%
Phase C	Sodium cocoamphoacetate	5.6%
Phase D	Lauryl glucoside	4.4%
Phase E	Coco glucoside	1.2%
Phase F	Sodium/disodium cocoyl glutamate	3.6%
Phase G	Water	10.0%
	Glycerol	0.7%
	Water	10.0%
	Xanthan gum	2.0%
Phase H	Citric acid	to pH 6.0
Phase I	Preservative	q.s.

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TABLE 18

Shampoo		
Phase:	Product example C	2.0%
	Caprylic/capric triglyceride	0.5%
	Perfume	0.2%
Phase B	Water	to 100.0%
Phase C	Sodium lauryl sulphate	9.0%
Phase:	Cocamidopropyl betaine	3.0%
Phase E	Cocamide MEA	1.9%
	Xanthan gum	0.2%
	Water	10.0%
Phase F	Water	10.0%
	Polyquaternium-10	0.2%
Phase:	Citric acid	to pH 5.7
Phase H	Preservative	q.s.

TABLE 19

Deo		
Phase A	Product example E	3.0%
	<i>Glycine soja</i> (soybean) oil	0.2%
	Perfume	0.1%
Phase B	Phenoxyethanol	0.5%
	Caprylyl glycol	0.2%
Phase C	Water	50.0%
	Hydroxyethyl cellulose	0.75%
	Sodium hydroxide (10% in water)	0.25%
Phase D	Aluminium chlorohydrate	19.0%
Phase E	Water	to 100.0%

TABLE 20

Cleansing Oil Shampoo		
Water		to 100.0%
Sodium laureth sulphate		7.0%
MIPA-Laureth sulphate		4.0%
Sodium chloride		3.2%
Cocamidopropyl betaine		3.0%
Product example E		3.0%
Glycerol		2.5%
PEG-18 Castor oil dioleate		2.0%
Propylene glycol; PEG-55 Propylene glycol oleate		2.0%
Laureth-5 carboxylic acid		1.0%
<i>Persea gratissima</i> (avocado) oil		1.0%
Polyglyceryl-6 caprylate; Polyglyceryl-4 caprate;		0.9%
Propylene glycol		
Sodium benzoate		0.7%
Salicylic acid		0.3%
Linalool		0.2%
alpha-Isomethyl ionone		0.1%
Limonene		0.1%
<i>Zea mays</i> (corn) germ oil		0.2%
<i>Argania spinosa</i> oil		0.1%
<i>Camellia oleifera</i> seed oil		0.1%
Sodium hydroxide		0.3%
Citric acid		to pH 5.0
Perfume, Dyes		q.s.

TABLE 21

Pampering Oil Bath		
Water		to 100%
<i>Glycine soya</i> oil		20.0%
Product example B		10.0%
Polyglyceryl-3 palmitate		4.5%
Glyceryl caprylate		4.5%
<i>Simmondsia chinensis</i> seed oil		1.5%
<i>Prunus amygdalus dulcis</i> (sweet almond) oil		1.0%
<i>Triticum vulgare</i> germ oil		1.0%
Tocopherol		0.2%

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TABLE 21-continued

Pampering Oil Bath		
Limonene	0.1%	5
Linalool	0.1%	
Citral	0.1%	
Dyes	q.s.	10

TABLE 22

Shower Cream		
Water	to 100%	
Glycerol	7.5%	
<i>Glycine</i> soya oil	3.0%	
Lauryl glucoside	3.0%	
Sodium coco sulphate	3.0%	
Product example C	2.5%	20
Alcohol	1.5%	
Xanthan gum	1.5%	
<i>Butyrospermum parkii</i> butter extract	1.2%	
Sodium cetearyl sulphate	1.0%	
Sodium cocoyl glutamate	1.0%	
Disodium cocoyl glutamate	1.0%	
Tocopherol	0.1%	
<i>Helianthus annuus</i> seed oil	0.3%	
Limonene	0.1%	
Benzyl salicylate	0.1%	
Linalool	0.1%	
Dyes	q.s.	30

TABLE 23

Shower Gel		
Water	to 100%	
Sodium coco sulphate	5.0%	
Glycerol	5.0%	
Lauryl glucoside	4.0%	
Sodium lactate	2.5%	
Product example D	2.0%	40
Polyglyceryl-4 caprate	2.0%	
Sodium cocoyl glutamate	2.0%	
Disodium cocoyl glutamate	2.0%	
Alcohol	1.0%	
<i>Prunus cerasus</i> fruit extract	1.0%	
Polyglyceryl-6 caprylate; Polyglyceryl-4 caprate; Propylene glycol	1.0%	45
Limonene	0.1%	
Coumarin	0.2%	
Linalool	0.1%	
Citral	0.1%	
Dyes	q.s.	

TABLE 24

Liquid Soap		
Water	to 100%	
Glycerol	7.0%	
Alcohol	4.0%	
Sodium coco sulphate	3.0%	
Lauryl glucoside	2.5%	
Product example E	2.0%	60
Xanthan gum	1.5%	
<i>Mangifera indica</i> (mango) fruit extract	0.7%	
Limonene	0.1%	
Linalool	0.1%	
Dyes	q.s.	65

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TABLE 25

Shampoo for Children		
Water	to 100%	
Sodium coco sulphate	7.0%	
Decyl glucoside	5.0%	
Lactis Proteinum	3.5%	
Sorbitan caprylate	3.0%	
Product example F	3.0%	
Glycerol	2.5%	
Sodium lactate	2.5%	
Alcohol	2.0%	
Hydrolysed wheat protein	0.7%	
Hydrolysed wheat starch	0.7%	
Sodium chloride	0.9%	
Limonene	0.1%	
Citral	0.1%	
Phenethyl alcohol	0.1%	
Dyes	q.s.	

TABLE 26

Cream Soap		
Water	to 100%	
Alcohol	5.0%	
Coco glucoside	5.0%	
Glycerol	5.0%	
Product example F	2.5%	
Disodium cocoyl glutamate	2.0%	
Xanthan gum	1.5%	
Citric acid	to pH 5.5	
<i>Malva sylvestris</i> leaf extract	1.0%	
Glyceryl oleate	1.0%	
Sodium cocoyl glutamate	0.7%	
Linalool	0.1%	
Limonene	0.1%	
Dyes	q.s.	

TABLE 27

Make-up Remover		
Sodium cocoamphopropionate	5.0%	
Propylene glycol	35.0%	
Product example F	30.0%	
Glycerol	30.0%	
Preservative	q.s.	

TABLE 28

Make-up Remover		
Cocamidopropyl betaine	8.0%	
Water	79.0%	
Product example E	3.0%	
Glycerol	10.0%	
Citric acid	to pH 5.5	
Preservative	q.s.	

TABLE 29

Solution for Wet Wipes		
Product example E	1.5%	
Perfume	0.2%	
Glycerol	2.0%	
Sodium lactate; Sodium PCA; Glycine; Fructose; Urea;	0.2%	
Niacinamide; Inositol; Sodium benzoate; Lactic acid		
Water	95.6%	
Preservative	q.s.	

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TABLE 30

Solution for Wet Wipes	
Product example E	2.0%
Isopropyl myristate	0.3%
Phenoxyethanol; Methylparaben; Ethylparaben;	0.2%
Butylparaben; Propylparaben; Isobutylparaben	
Perfume	0.1%
Propylene glycol	3.0%
Water	94.0%
Cetrimonium bromide	0.1%

TABLE 31

O/W Make-up remover wipe	
Phase A Ethylhexyl stearate; Phenoxyethanol; Polyglyceryl-4 laurate; Sorbitan laurate; Dilauryl citrate	4.0%
Cetyl ricinoleate	0.8%
Phase B Water	to 100.0%
Glycerol	1.5%
Phase C Product example C	1.0%
Phase D Phenoxyethanol	0.1%
Perfume	q.s.
Preservative	q.s.

TABLE 32

Micellar water	
Water	to 100.0%
Product example D	5.0%
Glycerol	1.5%
Disodium cocoamphodiacetate	0.5%
Disodium EDTA	0.2%
Polyaminopropyl biguanide	0.2%
Citric acid, 30%	to pH 5.5

TABLE 33

Micellar Solution Cleanser	
Water	to 100.0%
Butylene glycol	5.0%
Coco glucoside	2.0%
Product example D	2.0%
Glycerol	1.0%
Allantoin	0.1%
<i>Cistus incanus</i> extract; Maltodextrin	0.2%
Perfume	0.2%
Citric acid, 30%	to pH 5.5

TABLE 34

Cleansing Water	
Water	to 100.0%
Product example E	2.5%
Phenoxyethanol; Ethylhexylglycerol	0.9%
Caprylic/capric triglyceride	0.5%
Glycerol	0.5%
Disodium EDTA	0.2%
Citric acid, 30%	to pH 5.5

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TABLE 35

Shower Crème	
Water	to 100%
Ammonium lauryl sulphate	10.0%
Product example D	2.0%
<i>Aloe barbadensis</i> leaf juice	2.0%
Cocamidopropyl betaine	2.0%
Decyl glucoside	1.0%
Glycerol	1.0%
<i>Prunus amygdalus dulcis</i> oil	0.5%
Glyceryl oleate	0.3%
Lauryl glucoside	0.3%
Coco glucoside	0.4%
Benzyl alcohol	0.2%
Benzoic acid	0.3%
Dehydroacetic acid	0.2%
Sodium benzoate	0.3%
Potassium sorbate	0.2%
Tocopherol	0.1%
Citric acid	to pH 4.5
Perfume, Dyes	q.s.

TABLE 36

Shower Crème	
Water	to 100%
Sodium laureth sulphate	8.0%
Product example F	3.0%
Cocamidopropyl betaine	3.0%
Glycerol	1.0%
Glucose	0.5%
<i>Prunus amygdalus dulcis</i> oil	0.7%
Sodium chloride	0.3%
Polyquaternium-7	0.3%
Styrene/acrylates copolymer	0.4%
PEG-200 Hydrogenated glyceryl palmate;	0.5%
PEG-7 Glyceryl cocoate	
Citric acid	to pH 5.5
Perfume, Dyes	q.s.

TABLE 37

Care shower	
Water	to 100%
Sodium laureth sulphate	9.0%
Sodium hydroxypropyl starch phosphate	2.5%
Product example E	2.0%
Cocamidopropyl betaine	2.0%
Petrolatum	1.0%
Sodium cocoyl glycinate	1.0%
Lauric acid	0.5%
Sodium lauroyl isethionate	0.5%
Glycerol	0.4%
<i>Helianthus annuus</i> seed oil	0.3%
<i>Olea europaea</i> fruit oil	0.2%
Sodium chloride	0.4%
Stearic acid	0.5%
Guar hydroxypropyltrimonium chloride	0.2%
Sodium Cocoyl isethionate	0.1%
Tetrasodium EDTA	0.1%
Alumina	0.1%
Citric acid	to pH 5.5
Perfumes, Dyes, Preservatives	q.s.

TABLE 38

Shower Crème	
Water	to 100%
Sodium coco sulphate	15.0%
Glycerol	3.5%

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TABLE 38-continued

Shower Crème	
Product example F	3.5%
Glycine soya oil	0.5%
Coco glucoside	0.8%
Caprylic/capric triglyceride	0.2%
Xanthan gum	0.8%
<i>Prunus amygdalus dulcis</i> oil	0.1%
<i>Simmondsia chinensis</i> seed oil	0.1%
Sodium cocoyl glutamate	0.3%
Disodium cocoyl glutamate	0.5%
Sodium cetearyl sulphate	0.2%

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TABLE 38-continued

Shower Crème	
Tocopherol	0.1%
<i>Helianthus annuus</i> seed oil	0.1%
Alcohol	0.5%
Citral	0.1%
Geraniol	0.1%
Limonene	0.1%
Linalool	0.1%
Citric acid	to pH 5.8
Perfume, Dyes	q.s.

TABLE 39

Further formulation examples										
	39a	39b	39c	39d	39e	39f	39g	39h	39i	39j
Water	to 100%									
Product example D	3.0%	4.0%	5.5%	1.0%	3.0%	3.0%	5.0%	4.0%	3.5%	3.0%
Sodium laureth sulphate	9.0%	8.0%	9.0%	—	—	—	—	—	—	—
Sodium lauryl sulphate	—	—	—	6.0%	—	—	—	—	3.5%	—
Cocamidopropyl betaine	—	2.0%	3.0%	7.0%	5.0%	6.0%	—	—	2.0%	7.0%
Sodium cocoamphoacetate	3.0%	—	—	1.5%	4.5%	—	3.0%	—	3.5%	—
Lauryl glucoside	—	—	—	—	3.5%	5.0%	3.0%	7.0%	—	—
Coco glucoside	—	2.0%	—	—	1.5%	1.0%	5.5%	2.5%	2.0%	—
Sodium cocoyl glutamate	—	—	—	—	—	1.0%	1.7%	5.0%	0.5%	—
Stearic acid	—	—	1.0%	—	—	—	—	—	0.1%	3.5%
Glyceryl glucoside	—	0.3%	—	—	0.3%	—	0.2%	—	—	—
Sucrose cocoate	0.5%	—	1.0%	1.0%	0.3%	0.2%	—	1.0%	1.0%	1.0%
Glycerol	0.5%	1.0%	0.5%	—	0.3%	0.4%	1.5%	1.0%	0.5%	1.0%
PEG-7 Glyceryl cocoate	—	0.3%	—	—	—	—	—	—	—	0.5%
Trideceth-9	—	0.2%	—	—	0.2%	—	—	—	—	—
Polysorbate 20	—	—	0.5%	—	—	—	—	—	0.3%	0.2%
PEG-40 Hydrogenated castor oil	—	—	0.3%	—	0.5%	—	—	—	1.0%	—
PEG-6 Caprylic/capric glycerides	—	—	—	—	0.3%	—	—	—	0.2%	0.2%
Polyglyceryl-4 caprate	—	—	—	2.0%	—	0.5%	—	0.5%	—	0.5%
Polyquaternium-10	—	0.2%	—	0.1%	—	—	—	0.2%	0.2%	—
Hydroxypropyl guar	0.2%	—	0.3%	0.2%	0.2%	0.2%	0.2%	0.1%	—	—
hydroxypropyltrimonium chloride	—	—	0.3%	—	0.3%	—	—	—	—	—
Silicone quaternium-22	—	0.3%	—	—	—	—	—	—	0.1%	—
Dimethicone	—	0.1%	—	0.1%	0.1%	—	—	—	0.5%	—
Amodimethicone	—	—	0.2%	0.1%	0.1%	—	0.2%	—	—	—
Argania spinosa oil	—	—	—	—	—	—	—	—	—	—
Prunus amygdalus dulcis oil	0.2%	—	0.2%	0.3%	—	0.1%	—	—	0.2%	0.2%
Olea europaea fruit oil	0.2%	0.1%	—	—	—	0.1%	—	0.2%	0.1%	—
Butyrospermum parkii butter extract	—	—	0.2%	—	0.1%	—	—	—	—	—
Persea gratissima oil	—	—	—	0.1%	—	0.1%	0.2%	—	—	—
Hydrogenated castor oil	—	0.2%	—	0.1%	—	—	—	—	0.1%	0.2%
Glycol distearate	—	0.5%	—	—	0.5%	—	0.3%	—	0.5%	0.5%
Isostearamide MIPA;	1.0%	—	—	1.5%	—	—	0.2%	—	1.0%	0.5%
Glyceryl laurate	—	—	0.5%	—	—	1.0%	—	—	—	—
Cocamide DEA	—	—	—	—	—	—	—	—	—	—
Sodium chloride	0.3%	1.2%	1.0%	0.5%	—	1.0%	—	1.0%	—	0.3%
PEG-120 Methyl glucose dioleate	0.2%	3.5%	1.0%	—	1.5%	—	—	—	0.5%	—
Xanthan gum	—	—	0.5%	0.8%	—	0.7%	2.0%	1.0%	—	—
Cellulose	—	—	—	0.1%	—	0.1%	0.1%	0.2%	0.1%	—
Zinc pyrithione	—	0.1%	—	—	—	—	—	—	0.1%	—
Benzophenone-4	—	0.1%	0.1%	0.1%	0.1%	—	0.1%	—	0.1%	—
Tetrasodium EDTA	0.1%	0.1%	—	0.1%	0.1%	—	—	—	0.1%	—
Caffeine	—	0.1%	0.1%	—	—	—	—	0.1%	0.1%	—
Hydrolysed keratin	—	—	0.1%	—	—	0.1%	0.2%	0.1%	0.1%	—
Panthenol	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	—	0.1%	0.1%	0.1%
Citric acid	to pH 5.5									
Perfumes, Dyes, Preservatives	q.s.									

TABLE 40

Further formulation examples										
	40a	40b	40c	40d	40e	40f	40g	40h	40i	40j
Water	to 100%									
Product example F	9.0%	5.0%	5.0%	4.0%	4.0%	2.5%	6.0%	4.0%	3.0%	3.0%
Sodium lauryl sulphate	—	8.0%	8.0%	—	—	—	—	3.5%	—	—
Coco betaine	—	5.0%	—	5.5%	—	—	—	3.0%	—	—
Cocamidopropyl betaine	—	—	3.0%	—	5.0%	—	—	—	3.0%	2.0%
Sodium cocoamphoacetate	—	—	2.5%	3.0%	—	5.0%	—	3.0%	4.0%	—
Disodium lauryl sulphosuccinate	—	—	1.0%	—	—	—	—	1.2%	—	—
Coco glucoside	—	—	—	3.0%	5.0%	4.0%	5.0%	1.0%	—	2.0%
Sodium cocoyl glutamate	—	—	—	2.5%	—	3.0%	4.5%	0.5%	2.5%	0.3%
Stearic acid	—	—	0.3%	—	—	—	—	0.1%	—	0.5%
Sodium cocoyl glycinate	—	—	—	—	5.0%	—	3.5%	—	2.0%	7.0%
Sodium lauroyl methyl isethionate	—	—	—	1.0%	—	1.5%	—	1.0%	0.5%	0.5%
Sucrose cocoate	0.5%	0.4%	—	1.0%	—	—	0.2%	0.3%	1.0%	0.3%
Glycerol	1.5%	0.3%	0.5%	0.5%	0.3%	0.5%	1.0%	0.5%	0.3%	1.0%
PEG-40 Hydrogenated castor oil	—	1.0%	—	—	—	—	—	0.3%	—	—
Polyglyceryl-4 caprate	0.5%	—	—	0.5%	—	2.6%	—	—	1.1%	—
Polyquaternium-11	—	0.2%	—	—	0.1%	—	—	0.2%	—	0.3%
Guar	—	—	0.3%	0.2%	0.2%	0.3%	0.2%	0.1%	0.2%	—
hydroxypropyltrimonium chloride	—	—	—	—	—	—	—	—	—	—
Dimethicone	—	0.3%	—	—	—	—	—	0.2%	—	—
Aminopropyl dimethicone	—	0.3%	0.5%	—	—	—	—	0.3%	—	—
<i>Helianthus annuus</i> seed oil	0.3%	—	0.1%	0.5%	—	0.1%	0.1%	0.2%	—	0.1%
<i>Olea europaea</i> fruit oil	0.2%	0.1%	0.2%	—	0.2%	0.1%	0.2%	—	0.6%	0.2%
PEG-3 distearate	—	0.5%	—	—	—	—	—	0.5%	—	—
Acrylates/C10-30 alkyl acrylate crosspolymer	0.5%	—	0.4%	—	0.5%	0.4%	—	—	0.5%	—
Sodium hydroxide, 25%	0.6%	—	0.6%	—	0.8%	0.5%	—	—	0.7%	—
Cocamide MEA	—	0.8%	1.0%	1.0%	—	0.2%	0.6%	1.0%	—	0.3%
Sodium chloride	0.2%	0.7%	0.2%	—	0.2%	0.1%	—	1.0%	0.2%	1.0%
Propylene glycol; PEG-55	—	2.5%	—	—	—	—	—	0.8%	—	—
Propylene glycol oleate	—	—	—	—	—	—	—	—	—	—
Xanthan gum	0.2%	—	0.2%	1.5%	0.5%	—	1.8%	0.2%	1.1%	0.9%
Hydroxyethyl ethylcellulose	0.1%	—	—	0.1%	—	0.1%	0.1%	—	—	—
Benzophenone-4	—	0.1%	0.2%	—	—	—	—	0.2%	—	0.1%
Menthol	0.1%	—	0.1%	—	—	0.1%	—	0.1%	0.1%	0.1%
Caffeine	—	—	0.1%	—	0.1%	—	—	0.1%	—	0.1%
Benzyl alcohol	0.1%	—	—	—	—	0.1%	—	0.1%	—	—
Coumarin	0.1%	—	0.1%	0.1%	—	—	0.1%	0.1%	—	0.1%
Hydrolysed wheat protein	—	—	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	—	—
Panthenol	0.1%	0.1%	—	0.1%	0.1%	0.1%	0.1%	—	0.1%	0.1%
Citric acid	to pH 5.2									
Perfumes, Dyes, Preservatives	q.s.									

TABLE 41

Further formulation examples										
	41a	41b	41c	41d	41e	41f	41g	41h	41i	41j
Water	to 100%									
Product example E	3.5%	3.0%	2.5%	4.0%	3.0%	4.0%	6.0%	4.0%	5.0%	4.0%
MIPA-Laureth sulphate	10.5%	5.0%	—	—	—	—	—	—	—	—
Sodium C14-16 olefin sulphonate	—	—	8.0%	—	—	—	—	—	3.5%	—
Coco betaine	—	4.0%	—	5.5%	—	—	4.0%	—	3.5%	—
Cocamidopropyl betaine	2.0%	—	4.0%	—	5.0%	5.0%	—	—	—	4.0%
Sodium cocoamphopropionate	—	—	1.0%	—	2.0%	—	1.5%	4.0%	2.0%	3.5%
Coco glucoside	—	2.5%	—	2.5%	3.0%	—	4.5%	3.5%	2.0%	0.5%
Sodium cocoyl glutamate	—	—	—	1.5%	1.0%	1.5%	1.5%	1.5%	0.8%	0.3%
Lauric acid	—	0.5%	—	—	—	1.0%	—	2.0%	—	4.5%
Sodium cocoyl glycinate	—	—	—	2.5%	—	5.0%	—	—	0.8%	0.5%
Sodium cocoyl sarcosinate	—	0.7%	0.5%	—	—	1.0%	0.5%	—	—	—
Dicaprylylether	0.5%	—	—	—	—	0.2%	—	—	—	—
Glycerol	0.5%	0.3%	0.5%	1.5%	0.4%	0.5%	1.0%	0.5%	0.3%	1.0%
Polysorbate 20	0.5%	—	—	—	—	0.5%	—	—	—	0.4%
Polyglyceryl-4 laurate	0.5%	—	0.4%	0.3%	—	—	0.5%	—	1.1%	—
Polyquaternium-37	0.4%	—	—	0.1%	—	—	—	0.2%	0.1%	—

TABLE 41-continued

Further formulation examples										
	41a	41b	41c	41d	41e	41f	41g	41h	41i	41j
Hydroxypropyl guar	—	0.2%	0.1%	0.2%	—	—	0.3%	—	0.2%	—
hydroxypropyltrimonium chloride	—	0.1%	—	—	0.2%	—	—	—	—	—
Cassia	—	0.1%	—	—	0.2%	—	—	—	—	—
hydroxypropyltrimonium chloride	—	0.1%	—	—	0.2%	—	—	—	—	—
Sodium hydroxypropyl starch phosphate	0.2%	—	—	—	—	0.4%	—	—	—	0.5%
Hydroxypropyl methylcellulose	0.2%	—	—	0.2%	0.2%	—	—	—	0.2%	—
Dimethicone	0.2%	—	—	—	—	1.0%	—	—	0.3%	—
Aminopropyl dimethicone	0.2%	0.4%	—	—	—	0.5%	—	—	—	0.5%
Palmitamidopropyltrimonium chloride	0.3%	—	0.5%	—	—	—	—	—	0.4%	—
<i>Persea gratissima</i> (avocado) oil	0.1%	1.1%	—	0.1%	0.2%	—	0.3%	—	0.1%	0.1%
<i>Butyrospermum parkii</i> butter extract	0.2%	—	0.1%	—	—	0.3%	—	—	—	—
<i>Prunus amygdalus dulcis</i> oil	0.2%	—	0.2%	0.2%	—	—	0.2%	0.5%	—	—
Glycol distearate	0.5%	0.7%	—	—	0.5%	0.8%	—	—	0.4%	0.3%
Carbomer	—	0.3%	—	—	—	0.5%	0.7%	—	0.5%	—
Sodium hydroxide, 25%	—	0.5%	—	—	—	0.7%	1.0%	—	0.8%	—
Isostearamide MIPA; Glyceryl laurate	0.7%	—	0.8%	—	0.3%	0.3%	—	0.4%	—	0.3%
Sorbitan sesquicaprylate	—	—	0.2%	1.0%	—	—	0.4%	1.0%	—	0.7%
Sodium chloride	0.8%	—	0.3%	0.2%	0.5%	—	—	2.0%	—	—
PEG-18 Glyceryl oleate/cocotate	0.8%	—	—	—	—	0.6%	—	—	—	0.9%
Xanthan gum	—	1.0%	0.2%	1.0%	—	0.2%	0.3%	—	—	0.2%
Algin	—	0.2%	—	—	1.0%	—	—	—	1.2%	—
Caragenaan	0.5%	—	—	0.3%	—	—	—	0.3%	—	0.2%
Silica	0.1%	—	0.1%	—	—	0.2%	—	—	0.2%	0.1%
Cetearyl alcohol	0.2%	—	—	—	0.3%	0.2%	—	—	—	0.3%
Benzophenone-4	0.1%	0.1%	0.2%	—	0.2%	0.2%	—	—	—	0.1%
Tetrasodium EDTA	0.1%	0.1%	—	0.1%	0.1%	0.2%	0.1%	—	0.2%	0.1%
Octopirox	0.2%	—	—	—	—	0.1%	—	—	—	—
Zinc PCA	—	—	0.1%	—	—	—	—	—	—	0.1%
Creatine	0.1%	—	0.1%	0.1%	—	0.1%	0.1%	0.1%	—	0.1%
Hydrolysed collagen	—	—	—	0.1%	—	0.1%	—	0.1%	0.1%	0.1%
Salicylic acid	0.1%	—	—	—	0.1%	0.1%	—	—	0.1%	0.1%
Panthenol	0.1%	0.1%	—	0.1%	0.1%	0.1%	0.1%	—	0.1%	0.1%
Lactic acid	0.2%	—	0.2%	—	0.1%	0.5%	0.3%	—	0.2%	—
PEG-14M	0.3%	—	—	—	—	0.4%	—	—	—	0.3%
1,2-Hexanediol	0.3%	—	—	—	—	0.3%	—	0.2%	—	—
Citric acid	—	—	—	—	—	—	—	—	—	—
Perfumes, Dyes, Preservatives	—	—	—	—	—	—	—	—	—	—

TABLE 42

List of raw materials used	
INCI	Trade name, company
1,2-Hexanediol	Hydrolite-6 841129, Symrise
Acrylates/beheneth-25 methacrylate copolymer	Novethix L-10 Polymer, Lubrizol
Acrylates/C10-30 alkyl acrylate crosspolymer	TEGO Carbomer 841 SER, Evonik Industries AG, 100%
Algin	Hydagen 558 P, BASF
Allantoin	Allantoin, DSM Nutritional Products, Inc.
<i>Aloe barbadensis</i> leaf juice	Aloe-Con UP 40, Florida Food Products Inc.
alpha-Isomethyl ionone	alpha-Isomethylionone, Chemos GmbH
Alumina	Aeroxide Alu C, Evonik Industries AG
Aluminium chlorohydrate	Locron L, Clariant
Ammonium lauryl sulphate	Empicol AL 70, Albright & Wilson UK Limited
Aminopropyl dimethicone	ABIL ® Soft AF 200, Evonik Industries
Amodimethicone	DC 949, Dow Corning, 100%
<i>Argania spinosa</i> oil (<i>Argania spinosa</i> kernel oil)	Argan Oil, DSM Nutritional Products Ltd.
Benzophenone-4	Uvinul MS 40, BASF Corporation
Benzoic acid	OriStar HSB, Orient Stars LLC

TABLE 42-continued

List of raw materials used	
INCI	Trade name, company
Benzyl alcohol	Microcare BNA, THOR PERSONAL CARE SAS
Benzyl salicylate	Seridefrizz Intense, Cheemyunion Quimica Ltda.
Butylene glycol	Butylene Glycol, Oxea Corporation
<i>Butyrospermum parkii</i> butter extract	Cosmosil 600, International Cosmetic Science Centre
Caffeine	Caffeine, Merck KGaA/EMD Chemicals, Inc.
<i>Camellia oleifera</i> seed oil	<i>Camellia Sasanqua</i> Oil, Ikeda Corporation
Caprylyl glycol	Sensiva SC 10, Schülke & Mayr GmbH
Capryl/capramidopropyl betaine	TEGO Betain 810, Evonik Industries AG, 38%
Caprylic/capric triglyceride	TEGOSOFT CT, Evonik Industries AG, 100%
Carrageenan	Genugel Carrageenan, CP Kelco
Carbomer	TEGO Carbomer 140, Evonik Industries AG, 100%
Cassia	Formularbeginn
hydroxypropyltrimonium chloride	Sensomer ST 250-Polymer, Lubrizol
Cellulose	Formularende
	Arbocel A300, J. Rettenmaier & Söhne

TABLE 42-continued

List of raw materials used	
INCI	Trade name, company
Cetearyl Alcohol	TEGO Alkanol 1618, Evonik Industries AG, 100%
Cetyl ricinoleate	TEGOSOFT CR, Evonik Industries AG, 100%
Cetrimonium bromide	Rhodaquat M-242B/99, Rhodia
<i>Chamomilla recutita</i> (matricaria) extract	Recentia CR, AkzoNobel Global Personal Care
Citral	Citral FF, Symrise AG
Citric acid	Citric Acid USP Granular, DSM Nutritional Products, Inc.
<i>Citrus aurantifolia</i> (lime) oil	AEC Lime Oil, A & E Connock, Perfumery & Cosmetics Ltd.
<i>Cistus incanus</i> extract;	TEGO Pearl N 300, Evonik Industries AG
Maltodextrin	
Cocamide DEA	REWOMID DC 212 S, Evonik Industries AG, 100%
Cocamide MEA	REWOMID D 212, Evonik Industries AG, 100%
Cocamidopropyl betaine	TEGO Betain F 50, Evonik Industries AG, 38%
Coco glucoside	Plantacare 818 UP, BASF Cognis, 51%
Coco betaine	Dehyton AB 30, BASF Cognis, 31%
Coumarin	Rhodiascent extra pure, Rhodia Organics
Creatine	TEGO Cosmo C 100, Evonik Industries AG, 100%
Decyl glucoside	Plantacare 2000 UP, BASF Cognis
Dicaprylylether	Cetiol OE, BASF Cognis
Dehydroacetic acid	Unisept DHA (Universal Preserv-A-Chem, Inc.)
Dimethicone	DC 200 Fluid 100 cSt, Dow Corning, 100%
Disodium cocoamphodiacetate	REWOTERIC ® AM 2 C NM, Evonik Industries, 39%-ig
Disodium cocoyl glutamate	Planatpon ACG LC, BASF Cognis
Disodium EDTA	Dissolvine NA-2-P, AkzoNobel Global Personal Care
Disodium lauryl sulphosuccinate	REWOPOL SB F 12 P, Evonik Industries AG, 95%
Ethylhexyl stearate;	TEGO ® Wipe Flex (Evonik Industries AG)
Phenoxyethanol;	
Polyglyceryl-4 laurate;	
Sorbitan laurate;	
Dilauryl citrate	
Geraniol	Nerol 800, International Flavors & Fragrances Inc.
Glucose	Organic Biovert Substrate, Lonza
Glycerol	Glycerol EP, vegetable, Spiga Nord, 99.7%
Glyceryl caprylate	Dermosoft GMCY, Dr. Straetmans
Glyceryl glucoside	Hydagen GG, BASF Cognis
Glyceryl oleate	TEGIN O V, Evonik Industries AG, 100%
<i>Glycine</i> soya (soybean) oil	Cropure Soybean, Croda Europe, Ltd.
Glycol distearate	TEGIN G 1100, Evonik Industries AG, 100%
Guar	Cosmedia Guar C 261, BASF Personal Care and Nutrition GmbH/Jaguar C-17, Rhodia Inc. and andere
hydroxypropyltrimonium chloride	
<i>Helianthus annuus</i> (sunflower) seed oil	AEC Sunflower Oil, A & E Connock, Perfumery & Cosmetics Ltd.
Hydrogenated castor oil	Cutina HR Powder, BASF Personal Care and Nutrition GmbH
Hydrolysed collagen	Nutrilan H, BASF Personal Care and Nutrition GmbH
Hydrolysed keratin	Kerasol, Croda, Inc.
Hydrolysed wheat protein	Glueadin WLM, BASF Cognis
Hydrolysed wheat starch	Cropeptide W, Croda, Inc.
Hydroxyethyl ethylcellulose	Structure Cel 4400 E, AkzoNobel Global Personal Care
Hydroxypropyl guar	Jaguar C-162, Rhodia, 100%
hydroxypropyltrimonium chloride	
Hydroxypropyl methylcellulose	TEGOCEL HPM 50, Evonik Industries AG, 100%
Isopropyl myristate	TEGOSOFT M, Evonik Industries AG, 100%

TABLE 42-continued

List of raw materials used	
INCI	Trade name, company
Isostearamide MIPA;	ANTIL SPA 80, Evonik Industries AG, 100%
Glyceryl laurate	AEC Lactic Acid, A & E Connock, Perfumery & Cosmetics Ltd.
Lactic acid	AEC Whey Protein, A & E Connock, Perfumery & Cosmetics Ltd.
Lactis proteinum	TEGO Alkanol L 4, Evonik Industries AG, 100%
Laureth-4	Marlowet 1072, Sasol Germany GmbH-Marl
Laureth-5 carboxylic acid	Prifrac 2920, Croda Europe, Ltd.
Lauric acid	Plantacare 1200 UP, BASF Cognis, 50%
Lauryl glucoside	AEC Lecithin Powder, A & E Connock, Perfumery & Cosmetics Ltd.
Lecithin	Dipentene No. 122, Hercules Inc.
Limonene	Lipofresh, Lipo Chemicals, Inc.
Linalool	OriStar MCL, Orient Stars LLC
Magnesium chloride	Farmal MD 10, Corn Products International
Maltodextrin	Herbasec Mallow Leaves, Cosmetochem International AG
<i>Malva sylvestris</i> leaf extract	Mango Extract, Draco Natural Products
<i>Mangifera indica</i> (mango) fruit extract	
Menthol	OriStar HSB, Orient Stars LLC
MIPA-Laureth sulphate	Zetesol 2056, Zschimmer & Schwarz GmbH
Octopirox	Octopirox, Clariant Intl. Ltd.
<i>Olea europaea</i> (olive) fruit oil	Cropure Olive, Croda Europe, Ltd.
Palmitamidopropyltrimonium chloride)	VARISOFT PATC, Evonik Industries AG, 60%
Panthenol	D-Panthenol USP, BASF, 100%
PEG-120 Methyl glucose dioleate	ANTIL 120 Plus, Evonik Industries AG, 100%
PEG-14M	Polyox WSR-205, The Dow Chemical Company
PEG-18 Castor oil dioleate	Marlowet CG, Sasol Germany GmbH
PEG-18 Glyceryl oleate/ cocoate	ANTIL 171 Plus, Evonik Industries AG, 100%
PEG-200 Hydrogenated glyceryl palmitate; PEG-7 Glyceryl cocoate	REWODERM LI S 80, Evonik Industries AG, 100%
PEG-3 Distearate	TEGIN D 1102, Evonik Industries AG, 100%; Cutina TS, BASF Cognis, 100%
PEG-40 Hydrogenated castor oil	TAGAT L 40, Evonik Industries AG, 100%
PEG-40 Sorbitan peroleate	Arlatone T, Croda
PEG-6 Caprylic/capric glycerides	TEGOSOFT DEC, Evonik Industries AG, 100%
PEG-7 Glyceryl cocoate	TEGOSOFT GC, Evonik Industries AG, 100%
<i>Persea gratissima</i> (avocado) oil	Cropure Avocado, Croda Europe, Ltd.
Petrolatum	Merkur 115, Sasol Wax GmbH
Phenethyl alcohol	Etaphen, Vevy Europe SpA
Phenoxyethanol	S&M Phenoxyethanol, Schülke & Mayr GmbH
Phenoxyethanol; Ethylhexyl glycerol	Euxyl PE 9010, Schülke & Mayr GmbH
Phenoxyethanol; Methylparaben; Ethylparaben; Butylparaben; Propylparaben; Isobutylparaben	Euxyl K 300, Schuelke & Mayr GmbH
Polyaminopropyl biguanide	Microcare MBG, Thor
Polyglyceryl-3 palmitate	Dermofeel PP, Dr. Straetmans
Polyglyceryl-4 caprate	TEGOSOFT PC- 41, Evonik Industries AG, 100%
Polyglyceryl-6 caprylate; Polyglyceryl-4 caprate; Propylene glycol	TEGO Betain 55, Evonik Industries AG 35%
Polyquaternium-10)	Polymer JR 400, Amerchol, 100%
Polyquaternium-11	Dehyquart CC 11, BASF Personal Care and Nutrition GmbH/Luviquat PQ 11 PN, BASF Corporation
Polyquaternium-37	Cosmedia Ultragel 300, BASF Personal Care and Nutrition GmbH

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TABLE 42-continued

List of raw materials used	
INCI	Trade name, company
Polyquaternium-7	Merquat 550, Nalco, 100%
Polysorbate 20	TEGO SML 20, Evonik Industries AG, 100%
Potassium sorbate	Euxyl K 712, Schülke & Mayr GmbH
Propylene glycol	Euxyl K 320, Schülke & Mayr GmbH
Propylene glycol; PEG-55	ANTIL 141 Plus, Evonik Industries AG, 100%
Propylene glycol oleate	
<i>Prunus amygdalus dulcis</i> (sweet almond) oil	Cropure Almond, Croda Europe, Ltd.
<i>Prunus cerasus</i> (bitter cherry) fruit extract	<i>Prunus Cerasus</i> Fruit, Kirschen Extract, Botanica GmbH
<i>Ricinus communis</i> seed oil	Lipovol CO, Lipo Chemicals
Salicylic acid	OriStar HSB, Orient Stars LLC
Silica	Aerosil 130, Evonik Degussa GmbH
Silicone quaternium-22	ABIL T Quat 60, Evonik Industries AG, 65%
Silicone quaternium-22; Polyglycerol-3 caprate; Dipropylene glycol; Cocamidopropyl betaine	ABIL B 45, Evonik Industries AG, 30%
<i>Simmondsia chinensis</i> (jojoba) seed oil	AEC Jojoba Oil Refined, A & E Connock, Perfumery & Cosmetics Ltd.
Sodium benzoate	Euxyl K 712, Schülke & Mayr GmbH
Sodium C14-16 olefin sulphonate	Bioterge AS-40 AOS, Stepan
Sodium cetearyl sulphate	Lanette E, BASF Personal Care and Nutrition GmbH
Sodium cocoamphoacetate	REWOTERIC AM C, Evonik Industries AG, 32%
Sodium cocoamphopropionate	REWOTERIC AM KSF 40, Evonik Industries AG, 40%
Sodium coco sulphate	Texapon HC G, BASF Cognis
Sodium cocoyl glutamate	Plantapon ACG HC, BASF Cognis
Sodium cocoyl glycinate	Hostapon SG, Clariant; Amilite GCS-11, Ajinomoto
Sodium cocoyl sarcosinate	Crodasinic MS, Croda
Sodium/disodium cocoyl glutamate	PERLASTAN® SC 25 NKW, Schill&Seilacher, 25%,
Sodium hydroxide	Unichem SOHYD, Universal Preserv-A-Chem, Inc.
Sodium hydroxypropyl starch phosphate	Pure-Gel, Grain Processing Corporation
Sodium isethionate	Hostapon SI, Company Clariant International Ltd
Sodium lactate	Sodium Lactate Solution About 50%, Merck KGaA/EMD Chemicals, Inc.
Sodium lactate; Sodium PCA; Glycine; Fructose; Urea; Niacinamide; Inositol; Sodium benzoate; Lactic acid	LACTIL, Evonik Industries AG, 100%
Sodium laureth sulphate	Texapon NSO, BASF Cognis, 28%
Sodium lauroamphoacetate	ColaTeric SLAA, Colonial Chemical Inc
Sodium lauroyl isethionate	Yongan SLI, Huanggang Yongan Pharmaceutical Co., Ltd
Sodium lauroyl methyl isethionate	Iselux, Innospec Active Chemicals
Sodium lauryl sulphate	Texapon LS 35, BASF Cognis, 30%
Sodium trideceth sulphate	Rhodapex EST-30, Rhodia
Sorbitan caprylate	Sorbon S-10, Toho Chemical Industry Co., Ltd.
Sorbitan sesquicaprylate)	ANTIL Soft SC, Evonik Industries AG, 100%
Stearic acid	Pristerene 4922, Croda Europe, Ltd.
Styrene/acrylates copolymer	Neolone PE, The Dow Chemical Company
Sucrose cocoate	TEGOSOFT LSE 65 K, Evonik Industries AG, 100%
Tetrasodium EDTA	Neolone PE, The Dow Chemical Company
Tocopherol	Euxyl K 700, Schülke & Mayr GmbH
Trideceth-9	Marlipal O 13/90, Sasol Germany GmbH - Marl
<i>Triticum vulgare</i> germ oil	Cropure Wheatgerm, Croda Europe, Ltd.
Xanthan gum	Keltrol CG-SFT, CP Kelco, 100%
<i>Zea mays</i> (corn) germ oil	AEC Corn Germ Oil, A & E Connock, Perfumery & Cosmetics Ltd.

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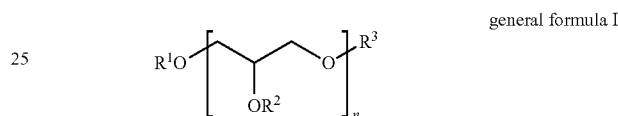
TABLE 42-continued

List of raw materials used	
INCI	Trade name, company
Zinc PCA	Zincidone, UCIB, Solabia Group
Zinc pyrithione	Microcare ZP, THOR PERSONAL CARE SAS

10 While the present invention has been particularly shown and described with respect to various embodiments thereof, it will be understood by those skilled in the art that the foregoing and other changes in forms and details may be made without departing from the spirit and scope of the present invention. It is therefore intended that the present invention not be limited to the exact forms and details described and illustrated, but fall within the scope of the appended claims.

20 What is claimed is:

1. A polyglycerol partial ester of general formula I



30 where

n=2 to 16,

R¹, R², R³=are, independently of one another, identical or different, selected from H, R⁴ and R⁵, where

R⁴=saturated or unsaturated acyl residue having 6-22 carbon atoms and comprising no hydroxyl groups,

35 R⁵=saturated or unsaturated acyl residue having 6-22 carbon atoms and comprising at least one hydroxyl group or an acyl residue of an oligomer of saturated or unsaturated acyl residues having 6-22 carbon atoms and comprising at least one hydroxyl group,

40 wherein the acyl residues R⁴ to R⁵ are present in a molar ratio in a range of 95:5 to 5:95.

2. The polyglycerol partial ester according to claim 1, wherein R⁴ and R⁵ are acyl residues of fatty acids.

45 3. The polyglycerol partial ester according to claim 1, wherein at least 50 mol % of the R⁴ acyl residues are selected from capryloyl, caproyl and lauroyl residues, based on all R⁴ residues in the polyglycerol partial ester.

50 4. The polyglycerol partial ester according to claim 1, wherein R⁵ is selected from ricinoyl and hydroxystearoyl residues, their oligomers and mixtures thereof.

55 5. The polyglycerol partial ester according to claim 1, wherein at least 90 mol % of the R⁵ acyl residues comprise ricinoyl residues or a mixture of ricinoyl and hydroxystearoyl residues, based on all R⁵ residues in the polyglycerol partial ester.

6. The polyglycerol partial ester according to claim 1, wherein R⁵ is selected from ricinoyl residues.

60 7. The polyglycerol partial ester according to claim 1, wherein a weight ratio of the polyglyceryl residue to the sum total of the acyl residues R⁴ and R⁵ is 85:15 to 55:45.

8. A method for preparing polyglycerol partial esters comprising the steps of:

65 A) providing a polyglycerol having a mean degree of polymerisation n=2 to 16,

B) acylating some of the hydroxyl groups of the polyglycerol with

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at least one first carboxylic acid derivative of one or more first, saturated or unsaturated carboxylic acids having 6-22 carbon atoms and comprising no hydroxyl groups, and

at least one second carboxylic acid derivative of one or more second, saturated or unsaturated carboxylic acids having 6-22 carbon atoms and comprising at least one hydroxyl group or an oligomer of the second carboxylic acid,

said carboxylic acid derivatives are selected from carboxylic acids and carboxylic esters, and

wherein a molar ratio of the acyl residues of the first carboxylic acid derivative to those of the second carboxylic acid derivative is in a range of 95:5 to 5:95.

9. The method according to claim 8, wherein during said acylating

at least one first carboxylic acid and at least one second carboxylic acid,

at least one first carboxylic ester and at least one second carboxylic acid,

at least one first carboxylic acid and at least one second carboxylic ester,

at least one first carboxylic ester and at least one second carboxylic ester,

at least one first carboxylic acid and at least one first carboxylic ester and at least one second carboxylic acid,

at least one first carboxylic acid and at least one first carboxylic ester and at least one second carboxylic ester,

at least one first carboxylic acid and at least one second carboxylic acid and at least one second carboxylic ester,

at least one first carboxylic ester and at least one second carboxylic acid and at least one second carboxylic ester,

or

at least one first carboxylic acid and at least one first carboxylic ester and at least one second carboxylic acid and at least one second carboxylic ester,

are used.

10. The method according to claim 8, wherein at least 50 mol % of the first carboxylic acids are selected from caprylic

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acid, capric acid and lauric acid, based on the acyl residues of all the first carboxylic acid derivatives.

11. The method according to claim 8, wherein at least 90 mol % of the second carboxylic acids are selected from ricinoleic acid and hydroxystearic acid, based on the acyl residues of all the second carboxylic acid derivatives.

12. The method according to claim 8, wherein at least 90 mol % of the second carboxylic acids comprise ricinoleic acid and hydroxystearic acid, and the second carboxylic acids have a molar ratio of ricinoleic acid residues to hydroxystearic acid residues in a range of 100 to 0.1 to 50 to 50, based on the acyl residues of all the second carboxylic acid derivatives.

13. The method according to claim 8, wherein a weight ratio of the polyglycerol to the sum total of the acyl residues of the first and second carboxylic acid derivatives used is 85:15 to 55:45.

14. The method according to claim 8, wherein a molar ratio of the acyl residues of saturated to unsaturated carboxylic acid derivatives used in said acylating is 99:1-1:99.

15. A polyglycerol partial ester obtained by a method according to claim 8.

16. A formulation comprising at least one polyglycerol partial ester according to claim 1.

17. The formulation according to claim 16, comprising: 0.1% by weight to 40% by weight of said polyglycerol partial ester, 0.01% by weight to 40% by weight of oil-soluble substance, and 10% by weight to 98% by weight of water.

18. A method comprising: mixing at least one polyglycerol partial ester according to claim 1 with at least one oil-soluble substance to provide a mixture; and treating said mixture with water, wherein said at least one polyglycerol partial ester solubilizes said least one oil-soluble substance upon said treating with water.

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